instruction manual

"T" NOBATRONS

INSTRUCTION MANUAL

Sorensen

Sorensen & Company, inc.
375 Fairfield Avenue
Stamford, Conn.

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SB-14-1879B - March, 1957

SORENSEN & COMPANY, INC., 375 Fairfield Avenue, Stamford, Conn.

I. GENERAL INFORMATION

Before you begin to use your new Sorensen instrument, we suggest that you read this Instruction Manual very carefully. The information contained herein is designed to help you obtain the maximum in performance and many years of dependable service from your instrument.

A. Shipping Damage

The instrument should be inspected and tested immediately upon arrival. In the event the unit fails to operate properly or is damaged in any way, the carrier should be notified at once. When the claim agent has inspected the shipment and prepared a report of damage, a copy of this report should be sent to us. At that time we will advise you concerning the repair or replacement of the instrument.

B. Service Information

All questions concerning the operation or malfunctioning of this instrument should be directed to the Service Department, Sorensen & Company, Inc., 375 Fairfield Avenue, Stamford, Connecticut.

IMPORTANT

BE SURE TO INCLUDE THE MODEL AND SERIAL NUMBER IN ALL CORRESPONDENCE CONCERNING THIS INSTRUMENT. WITHOUT THIS INFORMATION, WE MAY NOT BE ABLE TO GIVE YOU PROMPT AND ACCURATE SERVICE.

C. In the Event of Difficulty

Should you receive a defective or damaged instrument or require service on an instrument within or outside of warranty, please write us. Be sure to include as much information as possible concerning the symptoms of difficulty, the application, input line voltage, etc. The more information you give us, the faster we can handle your request.

In each case we will decide whether the instrument requiring service shall be (a) returned to the factory, (b) shipped to a service station, or (c) serviced at your plant by one of our field engineers or representatives.

D. Shipments

If the instrument should be returned to the factory, we will send you shipping instructions in the form of a Returned Material Tag. DO NOT SHIP A UNIT TO THE FACTORY WITHOUT THIS TAG,

D. Warranty

This instrument is warranted by Sorensen & Company, Inc., to be free from defects in material and workmanship. Our obligation to the original purchaser under the warranty is limited to servicing the instrument and replacing defective parts when the instrument is returned to the factory with transportation charges prepaid. No other warranties may be implied.

The period of warranty is one year after the date of delivery of the instrument to the original purchaser.

Defects caused by improper operating conditions, accidents, misuse, or negligence and the alteration or removal of the nameplate will void the warranty.

II. SPECIFICATIONS

The "T" Nobatron is a tubeless variable voltage DC power supply, possessing excellent line voltage regulation and transient response for line and load pulses.

"T" Nobatrons may be either self-contained or designed for relay rack or cabinet mounting. Complete details on each model are given in the following specifications.

The following tables will give the basic electrical and mechanical specifications of each instrument.

A. Table 1. Electrical Specifications.

Model		T50-1.5			
Input A.C.	Voltage Range	95-130			
	Frequency	60 cycles	± .1 cycle		
	Phase	1			
	Current (max)	1.75 amps			
Output D.C.	Voltage Range	3 ranges 0-10V 0-25V 0-50V			
	Current (max)	1.5 amps			

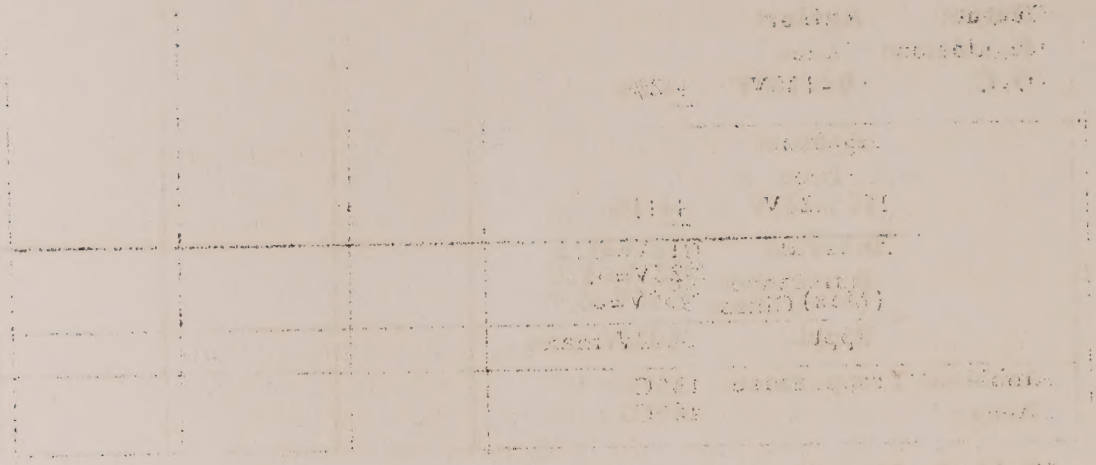
Table 1, continued

Output Regulation D.C.	Against Line 95-130V	± 2%			
	Against Line 105-125V	± 1%			
	Internal Resistance (Max) Ohms	@10V=1.5 @25V=3.0 @50V=6.0			
	Ripple	50MV max			
Ambient Temperature Range		15°C 40°C			

B. Table 2, Miscellaneous Specifications

Model	T50-1.5
Type Construction	Rack Mounting
Dimensions	
Rack	8-3/4" panel *
Cabinet	10-3/4" W 9-1/4" H 12" D
Weight	38 lbs.
Input Terminals	Line Cord (Rear)
Output Terminals	Binding Posts (Front)
ON-OFF Switch	Combined with Range SW
DC Output Overcurrent Protection	Fuse (Panel) Type 3AG 2A
AC Protective Fuse	(Panel) Type 3AG 1.5A
Meters	DC Volt. Stand.
Pilot Light	Yes
Voltage Adjustment D.C.	Variable auto trans.

* This model also available as dual supply (two units mounted side by side in same panel height).



C. Description of Electrical Specifications

1. D.C. Output Regulation

The D.C. output regulation is defined as the regulation against line changes of 95 to 130 volts. Against line changes of 105 to 125 volts, however, this accuracy improves as noted in Table 1.

2. Ambient Temperature Range

The ambient temperature ranges are stated above. While operation at lower and higher temperatures is possible, regulation is not guaranteed outside of these temperature limits. In the event any "T" Nobatron is to be exposed to unusual temperature conditions, we suggest consultation with the factory for information concerning precautionary measures. At such times full details on the application should be forwarded to us.

3. All wound components are vacuum varnish impregnated in the standard commercial manner.

III. INSTALLATION AND OPERATION

A. Terminals, Controls

1. Input Connection

The input power is applied by means of a line cord utilizing a three prong plug. Since the third prong of this plug is connected to the chassis, connection of the line cord to the appropriate receptacle automatically grounds the equipment. If the user does not have three prong outlets available, he should use an adapter. The user should make sure that the extra wire (coded green) coming out from the adapter is solidly grounded to the power line wiring system, preferably soldered. The aforementioned should be carried out for safety reasons, and also to minimize radio frequency noise.

2. Output Connection

The DC output is available at the two binding posts located on the front panel. The input is isolated from the output, and the entire circuitry is isolated from the chassis ground. This DC output is "floating" and hence may be grounded at either the plus or minus terminal.

CAUTION: In no instance should the output be connected to an external potential of over 250 volts to ground. Over 250 volts may cause a breakdown of the instrument's components.

3. On-Off AC Power Switch

The On-Off switch is either combined with the output voltage range switch or an overcurrent breaker. Refer to Table 2.

4. Output Range Switch

The output range switch located on the front panel determines the selected output range and the corresponding voltmeter range. On some models it is combined with the On-Off Switch as per Table 2.

5. Pilot Lamp

A pilot lamp is provided on the front panel to indicate when the AC power is applied. The pilot lamp remains lit even though F1 fuse is blown.

6. DC Voltmeter and Ammeter

A DC voltmeter is provided on the front panel to indicate output voltage. The voltmeter multipliers automatically change with the range switch. The voltmeter will not read if F2 is blown.

On some models (refer to Table 2) a DC ammeter is provided for reading output current.

7. DC Voltage Control Knob

A DC voltage control knob is provided on the front panel which actuates a variable auto-transformer. This transformer gives full output voltage adjustment from zero to the rated DC output of the range selected.

B. Fuses and Protective Devices

1. The AC Protective Fuse protects the internal variable auto transformer (voltage control) and other components from injury due to internal short circuits, etc. This fuse should normally never need replacing.

2. The DC output overcurrent protection is directly connected in the DC output circuit to protect the instrument against external overload or short circuits. This device is either a fuse or an overcurrent breaker per Table 2. The DC Voltmeter will not read if this device has opened due to overload. The circuit breaker must be reset manually after overload.

   CAUTION: Always replace the fuses with an exactly rated duplicate. An oversize fuse may cause breakdown of components, especially in germanium rectifiers.

C. Nameplates

Sorensen strongly suggests that the nameplate be retained, even if the instrument is to be incorporated with other equipment. This will eliminate later difficulties if service or parts are required.

D. To Commence Operation:

CAUTION: BEFORE OPERATION IS BEGUN, PLEASE REVIEW THE PRECEDING SECTION WITH REGARD TO CONTROLS.

1. Plug the input line cord into a 115V, 60 cycle outlet. See A-1 above.

2. Set the DC Output Range Switch to the desired output range.

   CAUTION: In order to prevent damage to the voltmeter or range switch, always turn the DC Output Control Knob to zero voltage or turn the power off before operating the DC Range Switch.

3. Turn on the AC power (on-off) switch. Note that the pilot light will now be lit and the voltmeter will simultaneously correspond to the selected range.

4. Adjust the output adjustment knob to obtain the exact voltage desired within the range selected.

   NOTE: It is always desirable to select the lowest voltage range possible, for this permits smoothest control, maximum voltmeter deflection, and the lowest internal impedance. The lower the internal impedance, the better the regulation (load).

IV. PRINCIPLE OF OPERATION

The operation of this instrument can be best understood by referring to the schematic diagram supplied with each instrument.

The "T" Nobatron DC power supplies are designed to eliminate line voltage variations from affecting the DC output voltage by means of a constant voltage transformer connected prior to the rectifiers. Unlike conventional regulator principles, these instruments do not eliminate load current variations from affecting the DC output voltage, but by using low impedance rectifiers, impedance of the DC section is minimized. Rectification is accomplished by means of germanium rectifiers, and the resultant DC voltage is selected and controlled by the variable transformer and range switch.

A. AC Regulating Circuit

The AC Regulating Circuit consists of the line voltage saturable transformer T1, linear reactor L1, and resonant capacitors. This circuit, which has a fast one to three cycle response, delivers a regulated AC voltage to the variable auto-transformer T2.

B. Voltage Varying Circuit

The variable auto-transformer, T2, selectively controls the AC voltage applied to the step-down transformer T3. Note that this transformer has a tapped secondary in order to permit full dial rotation of T2, on all three output voltage ranges. This tapped secondary, in addition, minimizes the impedance on the lower voltage range.

C. DC Circuit

The Range switch, SW1, selects the range desired and applies the voltage to the rectifier S1. This rectifier is an impedance germanium rectifier. Choke L2, together with Capacitors, serve to filter the DC voltage.

D. Breakdown of Components

Listed below are all the components used in these instruments, together with their function. They are presented for your understanding, and as a reference source for the functional description of the items on the Replacement Parts List. Referral to the schematic furnished with each instrument will give the position of each component in the circuitry, although no one instrument may have all the components listed.

C1--Resonant capacitor AC voltage circuit
C2--Filter capacitor, DC voltage circuit
C3--Filter capacitor, DC voltage circuit

F1--Fuse, protects components from internal shorts
F2--Fuse, protects against excessive output loads.
(omitted on some models)

L1--AC circuit Linear Reactor
L2--DC filter choke

PL1--Pilot lamp, indicates when AC voltage is on (front panel)

R1--Bleeder resistor selected by Switch SW1-C
R2--Bleeder resistor selected by Switch SW1-C
R3--Bleeder resistor selected by Switch SW1-C
R4--Meter multiplying resistor, selected by Switch SW1-D
R5--Meter multiplying resistor, selected by Switch SW1-D

S1--Germanium low impedance, rectifier assembly

SW1--Range selector switch (output DC volts and meter range)*
SW2--Overcurrent breaker and AC ON-OFF Switch.
(omitted on some models)

T1--AC voltage Saturable Transformer
T2--Variable Auto-Transformer
T3--Voltage step-down

VM--DC Voltmeter
AM--DC ammeter (omitted on some models)

* On some models, SW1 also includes AC ON-OFF Switch.

V. MAINTENANCE AND REPAIR

A. Maintenance

During normal life this instrument requires no maintenance other than the care afforded similar equipment. It is suggested that excessive dust, etc., be removed periodically exercising care to prevent damage by cleaning tools and excessively strong air blasts.

1. Spare Parts

All components used in these instruments are of a good commercial grade and can be expected to give a reasonably long period of trouble-free service. As the age of the instrument increases, however, some components are likely to deteriorate. We therefore suggest that the customer contact our Service Department for a list of the parts that should be kept on hand.

In the event it becomes necessary to replace any part, we strongly suggest that the replacement parts be of the same value as the original. Substitute parts should not be used unless we advise that the substitute part will not impair the performance of the instrument.

B. Repair

CAUTION: DANGEROUS VOLTAGES EXIST IN THIS INSTRUMENT. PLEASE OBSERVE APPROPRIATE PRECAUTIONS.

Typical circuit voltages and currents including direction of current are indicated on the schematic drawing supplied with each instrument. All voltage measurements should be taken with a 1000 ohm per volt meter. All current readings should be taken with as low a resistance meter as possible, 0.5 ohm or less.

SYMPTOM A NO OUTPUT VOLTAGE

Possible Cause	Check
1. Fuses blown or circuit breaker tripped.	1. Replace fuses or reset breaker.
2. Open circuit in wiring.	2. Test for continuity per schematic.
3. Defective Rectifier S1.	3. Check for normal AC voltage per schematic on T3 secondary. If this is present, replace rectifier.

SYMPTOM B LOW OUTPUT VOLTAGE (with Voltage Control full on)

Possible Cause	Check
1. Defective voltage regulating transformer	1. Check for normal AC voltage across T2. If this is not present, check T1 and L1 as well as C1, replace defective component.

2. Defective variable auto transformer or step-down transformer.	2. Check for normal AC voltage on these transformers. Replace defective component.
3. Defective rectifier S1.	3. Check for normal AC voltage per schematic on T3 secondary. If this is present, replace rectifier.

SYMPTOM C REDUCTION OF REGULATION RANGE OR POOR REGULATION

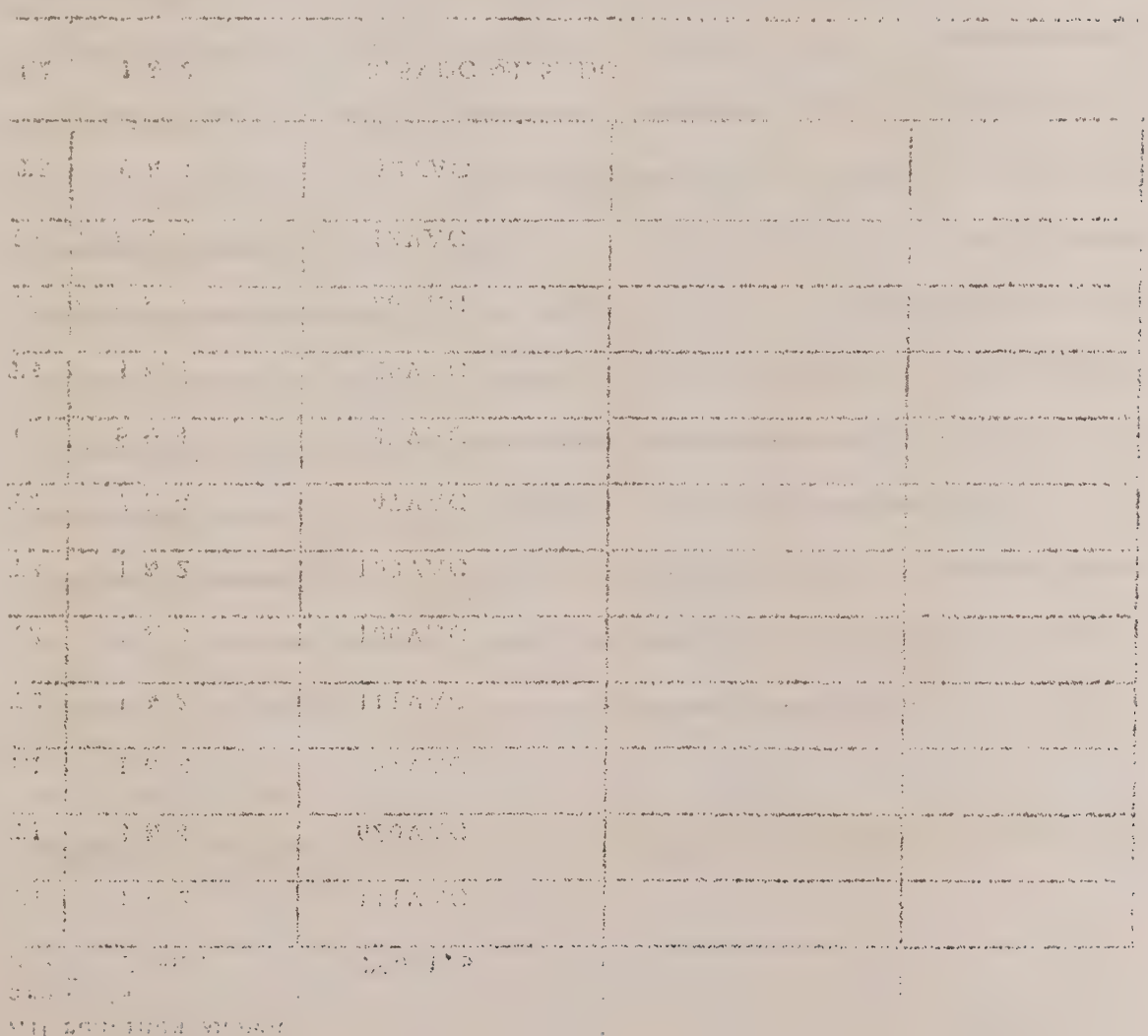
Possible Cause	Check
1. Defective voltage regulating transformer.	1. Check for normal AC voltage across T2. If this is not present, check T1, L1, and C1, and replace defective component.

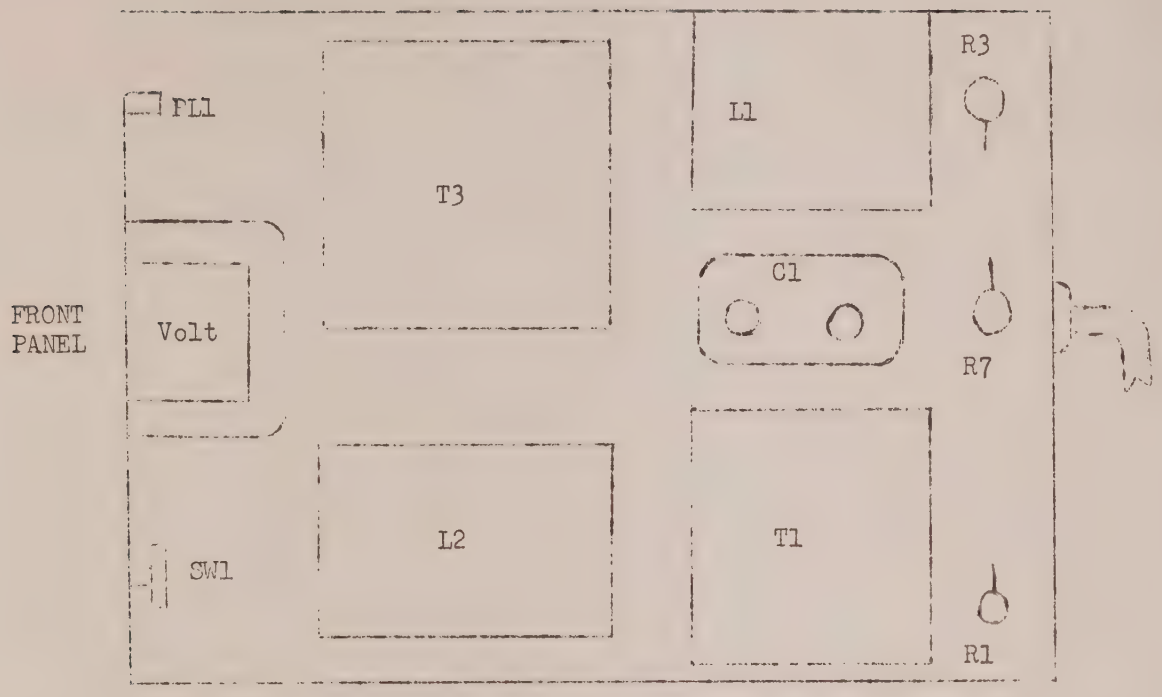
SYMPTOM D HIGH RIPPLE VOLTAGE

Possible Cause	Check
1. Defective capacitor C2	1. Check ripple across C2. This should be less than 1 volt AC. If this voltage is high, replace.
2. Defective DC choke or capacitor C3.	2. Replace C3 first. If still high ripple output, replace L2.

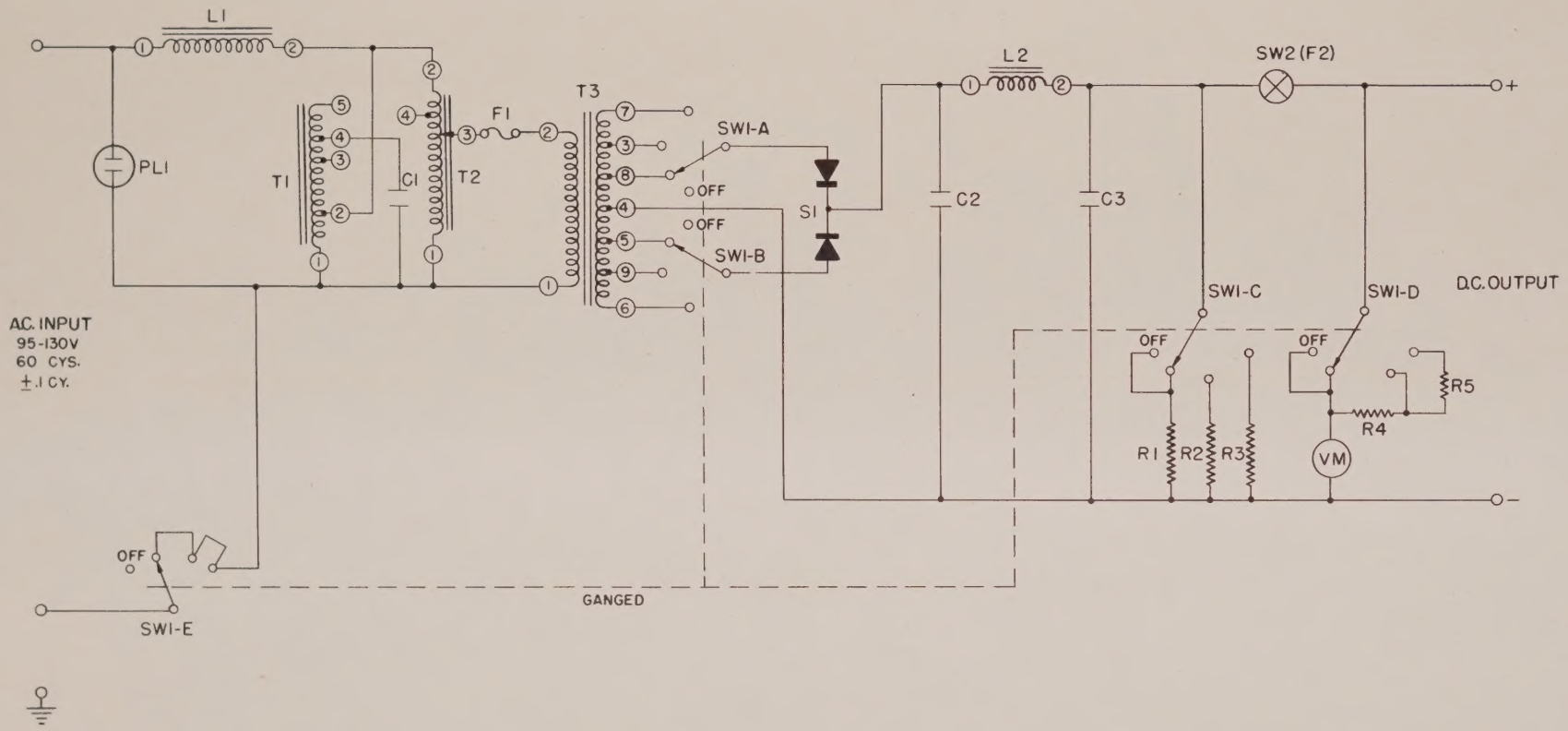
Checks Made with 115VAC Input, 50VDC Output at 1.5 Amp Load

All readings shown are ± 5% Item	Term.	T50-1.5		
T1	1 & 2	111VAC		
T1	3 & 4	620VAC		
L1	1 & 2	87VAC		
T2	1 & 2	111VAC		
T2	1 & 3	100VAC		
T3	1 & 2	100VAC		
T3	7 & 4	47VAC		
T3	6 & 4	47VAC		
T3	3 & 4	26VAC		
T3	9 & 4	26VAC		
T3	8 & 4	12VAC		
T3	5 & 4	12VAC		
L2	1 & 2	0.5VDC @1.5ADC Load		





CHASSIS LAYOUT - T50-1.5



SORENSEN & CO., INC. STAMFORD, CONN.	
REPRESENTATIVE "T" NOBATRON CURCUIT DIAGRAM	
DRAWN 3-15-57 VM APPROV. 3-15-57	
SD 200-1249	

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